

AD \_\_\_\_\_

Award Number: W81XWH-~~€~~ ~~€~~ ~~€~~ | €

TITLE: X^c!ã æ^ Ä^•^æ&@T æ ] [ , ^!Ö^ç^[[ ] { ^} oÄ! | Ö^Δ} •^

PRINCIPAL INVESTIGATOR: ÖiÄT EÜæ \ æÖ, ^!

CONTRACTING ORGANIZATION: V~ • Ä[ ]|^\*^ÄQ&È  
Ä[ • q } ÄT OÄGFFÁ

REPORT DATE: Ü^] c{ à^!ÄGFF

TYPE OF REPORT: Annual Ü~ { { æ^

PREPARED FOR: U.S. Army Medical Research and Materiel Command  
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for public release; distribution unlimited

The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision unless so designated by other documentation.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. <b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</b>					
1. REPORT DATE (DD-MM-YYYY) 01-09-2011		2. REPORT TYPE Annual Summary		3. DATES COVERED (From - To) 14 AUG 2010 - 13 AUG 2011	
4. TITLE AND SUBTITLE  Veterinaary Research Manpower Development for Defense				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER W81XWH-06-1-0640	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)  Dr. M. Sawkat Anwer   E-Mail: sawkat.anwer@tufts.edu				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Tufts College Inc. Boston, MA 02111				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Medical Research and Materiel Command Fort Detrick, Maryland 21702-5012				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; Distribution Unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT The long-term goal of this training program is to increase veterinary research manpower by providing research training to veterinary students. The proposed training program included joint degree programs (DVM/MPH, DVM/MS-CBS and DVM/MS-LAM) and the summer research program. Five trainees have graduated from TCSVM and are currently serving in US Army Veterinary Corps (1), enrolled in LAM residency program (2), conducting biomedical research (1) and in private practice (1). The 33 trainees currently in the joint degree program are continuing their training and the 17 trainees, recruited in the summer research program, have completed their research projects. No major problem was encountered with recruiting or maintaining trainee interests in the training program during the reporting period and hence we plan to continue the program as originally proposed.					
15. SUBJECT TERMS Veterinary Research Manpower, Joint-degree program, Summer Research Program					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT  UU	18. NUMBER OF PAGES  19	19a. NAME OF RESPONSIBLE PERSON USAMRMC
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U			19b. TELEPHONE NUMBER (include area code)

## Table of Contents

	<u>Page</u>
Introduction.....	4
Body.....	4
Key Research Accomplishments.....	7
Reportable Outcomes.....	8
Conclusion.....	8
References.....	8
Appendix 1.....	9
Appendix 2 .....	12

## INTRODUCTION:

The long-term goal of this training program is to increase veterinary research manpower by providing research training to veterinary students. The program is expected to develop a pipeline of research ready veterinarians to solve biodefense and public health problems facing our country, in general, and our armed forces in particular. The following training programs offered by Tufts Cummings School of Veterinary Medicine (TCSVM) were proposed for this purpose.

1. Summer Research Program
2. Four-year joint DVM/Master's degree in Public Health degree (DVM/MPH) program
3. Four-year joint DVM/Master of Science degree in Laboratory Animal Medicine (DVM/MS-LAM)
4. Five-year joint DVM/MS in Comparative Biomedical Science (DVM/MS-CBS)

During the summer research program, veterinary students are trained to conduct mentored research under the guidance of a faculty. Veterinary students are also recruited in joint degree programs that allow more specialized training in public health and laboratory animal medicine and more in-depth research training in comparative biomedical sciences.

## Body:

This is a training grant with training opportunities in multiple programs, and this progress report includes accomplishment from August, 2010 to August 2011 (fifth year) of this multi-year program.

**Program Implementation:** As proposed in the application, veterinary students were informed of the training program soon after receiving the award notice. A website as well as a brochure was created to inform veterinary students and faculty (<http://www.tufts.edu/vet/researchtraining/defense.html>). The website included the program description, responsibilities of trainees and mentors, list of program faculty and individual program directors and an application package. In addition, students and faculty were informed of the program via email with reference to the website and a seminar was held to explain the program to students and program faculty. Prospective trainees were asked to contact program faculty for summer research projects and program directors for the joint-degree programs.

**Recruitment:** The goal of the program during the reporting period was to recruit 15 trainees in the Summer Research Program, 6 trainees in DVM/MPH, 3 trainees in DVM/MS-LAM and 2 trainees in DVM-MS-CBS programs. Thirty five students applied for the 15 trainee positions for the Summer Research Program, 6 students applied for the DVM/MPH, 4 students applied for the DVM/MS-LAM program and 3 students applied for the DVM/MS-CBS program. Seventeen trainees out of 35 applicants for the Summer Research Program were selected based on the scientific merit of the proposal, academic standing in the veterinary school, relevance to biodefense and stated interest in an army career. All applicants in the other programs were selected because of availability of the slots; all applicants met the criteria for acceptance. All recruited trainees in various combined degree programs are listed in table 1, and in the summer research program are listed in table 2.

**Progress to date:** Four trainees in DVM/MS-LAM and 1 trainee in DVM/MPH programs have graduated in 2011. Of the 5 graduates, one is serving in US Army Veterinary Corps, two are enrolled in LAM residency program, one in biomedical research and one in private practice. All other trainees in the DVM/MS-LAM and DVM/MPH are still in the program, are in good academic standings and are expected to complete their training in years listed in table 1. Of the 6 trainees currently in the DVM/MS-CBS program, two have completed all the requirements for the MS portion of the program; one submitted a thesis and three started the program this year. All 17 trainees in the summer research program have completed their research projects (Table 2) and are in the process of preparing research reports due by the middle of September, 2011. These trainees will present their research work at the annual veterinary student research day on October 12, 2011. They will also compete for three awards based on the written report and the oral presentation, and will receive the award at the end of

the annual veterinary student research day. Note that all trainees in DVM/MS-CBS completed the summer research program before entering the combined degree program.

All trainees were required to attend and attended a special information session by Captain Sean Majoy (US Army Veterinary Corps) on career opportunities in the US Armed forces for veterinarians. This session was organized by the local US Army recruiting officers and was held on October 18, 2010.

**Table 1: Trainees recruited in 2007-2010 and 2011 (in bold) in various combined degree programs**

**A. DVM/MS-LAM Program**

Name of Trainee	Training Program	Training Completion Year	DVM Graduation Year	Current position
Misty Willimas	DVM/MS-LAM	2008	2008	Lab Animal Vet at Medical School of Georgia
Kristina Asselin	DVM/MS-LAM	2010	2010	LAM resident at Yale University
Elizabeth Carbone	DVM/MS-LAM	2013	2013	TCSVM student
Jessica Connolly	DVM/MS-LAM	2009	2009	Serving US Army Vet. Corp.
Julia Goldman	DVM/MS-LAM	2011	2011	Lab animal Residency, John Hopkins University
Amanda Graveline	DVM/MS-LAM	2011	2011	Biomedical Research, Wyss Institute, Boston
Marian Schenk	DVM/MS-LAM	2014	2014	TCSVM student
Amory Koch	DVM/MS-LAM	2011	2011	Serving US Army Vet. Corps
Wenjun Li	DVM/MS-LAM	2009	2009	Biomedical Research
Lindsey Miller	DVM/MS-LAM	2010	2010	Medicine and surgery Internship
Mayrav Moreshet	DVM/MS-LAM	2009	2009	Biomedical Research
Morgan Oexner	DVM/MS-LAM	2013	2013	TCSVM student
Diane Peters	DVM/MS-LAM	2015	2015	Currently pursuing the PhD part of the combined DVM/PhD program
Melissa Timm	DVM/MS-LAM	2010	2010	LAM Resident at Wake Forest University
Stephanie Woods	DVM/MS-LAM	2011	2011	Lab animal Residency, MIT, Cambridge, MA
<b>Charles Byrd</b>	DVM/MS-LAM	2014	2014	TCSVM student
<b>Cecilia de Souza</b>	DVM/MS-LAM	2014	2014	TCSVM student
<b>Rebecca LaFleur</b>	DVM/MS-LAM	2014	2014	TCSVM student
<b>Rebecca Lossing</b>	DVM/MS-LAM	2014	2014	TCSVM student

**B. DVM/MPH Program**

Name of Trainee	Training Program	Training Completion Year	DVM Graduation Year	Current position
Karen Alroy	DVM/MPH	2012	2012	Fogarty Scholar
Colin Basler	DVM/MPH	2012	2012	TCSVM student
Lauren Bifano	DVM/MPH	2012	2012	TCSVM student
Madalyn Black	DVM-MPH	2014	2014	TCSVM student
Stephen Diaz	DVM-MPH	2014	2014	TCSVM student
Amber Durrell	DVM/MPH	2013	2013	Left the program
Anne Fleming	DVM/MPH	2013	2013	TCSVM student
Kylynn Fontaine	DVM-MPH	2014	2014	TCSVM student
Elliott Garber	DVM/MPH	2009	2009	Serving US Army Vet. Corp.
Katherine Haman	DVM/MPH	2012	2012	Left the program
Tammy Han	DVM/MPH	2009	2009	Private practice

Ashley-Rose Hart	DVM-MPH	2014	2014	TCSVM student
Miranda Hillyard	DVM/MPH	2011	2011	Private Practice
Lauren Krone	DVM/MPH	2013	2013	TCSVM student
Jennifer McRobbie	DVM-MPH	2010	2010	Private practice
Sarah Merriday	DVM-MPH	2014	2014	TCSVM student
Cecilia Murch	DVM/MPH	2013	2013	TCSVM student
Misha Robyn	DVM/MPH	2009	2009	Private practice
Marieke Rosenbaum	DVM-MPH	2012	2012	Fogarty Scholar
Emily Roye	DVM-MPH	2013	2013	TCSVM student
<b>Sara Dale</b>	DVM-MPH	2015	2015	TCSVM student
<b>Philip "PJ" Hamel</b>	DVM-MPH	2015	2015	TCSVM student
<b>Shira Kedmi (Rothstein)</b>	DVM-MPH	2015	2015	TCSVM student
<b>Aliza Gentili-Lloyd</b>	DVM-MPH	2015	2015	TCSVM student
<b>Evin Luehrs</b>	DVM-MPH	2015	2015	TCSVM student
<b>Kyle Ross</b>	DVM-MPH	2015	2015	TCSVM student

### C. DVM/MS-CBS Program

Name of Trainee	Training Program	Training Completion Year	DVM Graduation Year	Current position
Elliott Garber	DVM/MS-CBS	2008	2009	Serving in US Army Vet. Corp.
Jessica Hekman	DVM/MS-CBS	2010	2012	Thesis completed
Katherine Megquire	DVM/MS-CBS	2010	2012	Thesis Completed
Marieke Rosenbaum	DVM/MS-CBS	2009	2012	Thesis completed, Fogarty scholar
Karyn Vonlderstein	DVM/MS-CBS	2008	2010	Post-doctoral fellow, MGH, Boston
Jena Thomas	DVM/MS-CBS	2011	2013	Thesis Submitted
<b>Bronwen Childs</b>	DVM/MS	2012	2013	Started MS program
<b>Marian Schenk</b>	DVM/MS	2012	2014	Started MS program
<b>Cristina Carballo</b>	DVM/MS	2012	2014	Started MS program

**Summer Research Program:** Seventeen trainees were recruited in the summer research program. The 2010 summer research trainee and the project titles are summarized in table 2, and the summary of each project is listed in appendix 2.

**Table 2: Trainees recruited in 2011 Summer Research Program**

Name of Trainee	Mentor	Project title
Burns, Monika	Dr. C. Sharp	Evaluation of Serum NT-pCNP as a Diagnostic, Monitoring and Prognostic Biomarker for Dogs Hospitalized in an ICU Setting
Chalam, Yamini	Dr. G. Kaufman	Nutritional Analysis and Comparison of Diets Offered to Captive Elephants in Nepal
Fleming, Anne	Dr. S. Marshall and Dr. J. Lindenmayer	Quantifying the Spatial Distribution and Population Size of Feral Cat Colonies in Rhode Island as a Function Population Management Strategies
Gordon, Max	Dr. Siobhan Mor	Evaluating Cost-Effective Rabies Treatments in Uganda
Hamilton, Jessie	Dr. Robyn Alders	Identification of Constraints Impacting Poultry Production in Muchila, Zambia

Holmes, Katherine	Dr. Jean Mukherjee and Dr. Kevin Lindell	Surveillance of Brucella spp.in the goat population of the Dominican Republic
Jacobus, Kristy	Dr. Sandra Ayres and Dr. Joanne Connolly	Characterization of the Reproductive Cycle of the Platypus ( <i>Ornithorhynchus anatinus</i> ) Through Non-Invasive Identification of Fecal Hormone Metabolites
Khodari, Joe	Dr. D. Penninck	Ultrasonography of Colonic and Cecal Neoplasia in Cats
Lim, Sarah	Dr. L. Wetmore	Optimizing the Use of Pulse Oximetry and Assessing its Usefulness in Detecting Decreased Pulmonary Function in Elephants with Tuberculosis
Murch, Cecilia	Dr. J. Lindenmayer	Rabies Prevention in Kathmandu, Nepal: Evaluating the Efficacy of Canine Sterilization and Vaccination
Penrod, Casey	Dr. BB Verma	Studies on the Effect of Teat Dipping Post-Milking of Lactating Crossbreed Cows in Control of Subclinical Mastitis
Pogue, Natasha	Dr. BB Verma	Seroprevalence of Caprine Brucella melintensis in West Bengal, India
Roye, Emily	Dr. E. McCobb and Dr. J. Lindenmayer	Assessment of Handwashing Protocols and Attitudes at Boston Area Animal Shelters
Sowy, Stanley	Dr. A. Sheoran	Neutralization of Stx2 by scFvs
Tucker, Casey	Dr. Mark Pokras	Ducks as Biological Parasite Control: A Survey of Snails, Rats, Ducks and Gibbons, and the Prevalence of <i>Angiostrongylus cantonensis</i> at the Pingtung Rescue center, Taiwan
Turner, Laura	Dr. E. Rozanski and Dr. E. McCobb	Relationship Between Serum 25-Hydroxyvitamin D Level and Diagnosis of Upper Respiratory Infection in Cats in the Shelter Environment
Whitford, Annie	Dr. Alison Robbins	Terbinafine Dosage and Safety in WNS Infected Myotis Lucifugus: Correlation of Survival, Drug Tissue Levels, and Toxic Effects

Each trainee in the Summer Research Program is required to complete a survey to provide feedback on their research experience and future plan. The survey data for the reporting period will be available after the due date of this progress report and will be included in future progress reports. The survey data from 9 trainees last year (2010) revealed the following: 100% had a stimulating research experience and 69% plan to obtain more research experience while in veterinary school, 23% considered entering a combined degree program, 84% were interested in getting involved in research after completing the DVM program and 8% were interested in joining the army.

### Key Research Accomplishments

The goal of this program is to provide research training to veterinary students by allowing them to participate either in a research project over the summer months (Summer Research Program from June to August) or a year-long hypothesis driven research (DVM/MS-CBS). The short term summer research training usually does not result in the publication of a manuscript, as the trainees are still learning the research methods and the project is usually not completed during the summer months. Thus, the focus is to get the trainees interested in research including how to evaluate and prepare scientific publications. Since the final report of the 2011 summer research accomplishments is not due until the middle of September, 2011, i.e., after the due date of this progress report, key research accomplishment will be reported in the next annual progress report. Thus, the research accomplishment of 2010 summer research is included in this report (see appendix 1) and the major findings are summarized below.

1. It is important to maintain recommended parameters for the cold chain from Dar Es Salaam to Singida for the storage refrigerators without the loss of activity of the thermotolerant I-2 Newcastle disease vaccine.
2. It is possible to measure rotational and translational motion of equine meta-carpophalangeal joint in 3D space with a high degree of accuracy ( $\pm 0.08$  mm) using the XROMM (X-ray Reconstruction of Moving Morphology) model.
3. Males and females nesting at low and high densities play an equal role in the dissemination of antibiotic resistance.
4. *T. gondii* seropositive cats had significantly lower levels of hemoglobin, red blood cell counts, and hematocrit ( $P < 0.05$ ) than seronegative cats.
5. Smoking or cooking of bush meat can be incomplete, and does not completely destroy the genomic integrity of some viruses. This result raises concerns about the potential risk of infection to either animals or people exposed to imported bush meat.
6. The PCR screen was a quick and effective means of screening for avian haemoparasite.

### Reportable Outcomes:

1. Six (6) trainees were recruited in the DVM/MPH joint degree program
2. Four (4) trainees were recruited in the DVM/MS-LAM joint degree program
3. Three (3) trainees were recruited in the DVM/MS-CBS joint degree program
4. Seventeen (17) trainees were recruited in the summer research program
5. Five trainees graduated with one serving in US Army Veterinary Corps, two enrolled in LAM residency program, one pursuing biomedical research and one in private practice.

### Conclusion

The fifth year of this multi-year program is considered to be successful, as evidenced by the number of trainees recruited in the program and the activities of the graduates. All trainees in the combined degree program are making satisfactory progress. Although no peer-reviewed publications have resulted from the research conducted by the trainees, some of the trainees presented their work at national meetings (see below). No major problem was encountered with recruiting or maintaining trainee interests in the training program during the reporting period and hence we plan to continue the program as originally proposed.

**References:** Four abstracts were presented at a national meeting.

1. **Whitford, A.M.**, Robbins, A., Duan, S.X., Court, M.H.: HPLC-MS assay Validation and use for terbinafine pharmacokinetics in WNS infected little brown bats (*Myotis lucifugus*). 2011 Merit-NIH National Veterinary Scholars Symposium, Page 42, August 4-6, Orlando, Florida.
2. **Holmes, K.**, Dargam, P., Lambden, K., Quirico, J., Hernandez, J., Lindemayer, J., Lindell, K., Mukherjee, J.: Preliminary studies for the identification of *Brucella melitensis* in the Dominican Republic goat population. 2011 Merit-NIH National Veterinary Scholars Symposium, Page 38, August 4-6, Orlando, Florida.
3. **Khodari, J.**, Penninck, D., Taymens, O., Burgess, K.: Ultrasonography of colonic and cecal neoplasia in cats. 2011 Merit-NIH National Veterinary Scholars Symposium, Page 72, August 4-6, Orlando, Florida.
4. **Sow, S.**, Challa, S., Tzipori, S., Sheoran, A.: Expression of STX2-neutralizing human monoclonal antibodies as single-chain Fv fragments in *Escherichia coli*. 2011 Merit-NIH National Veterinary Scholars Symposium, Page 88, August 4-6, Orlando, Florida.

**Appendices:** The following documents have been appended:

1. Summary of 2010 Summer Research reports
2. Abstracts of 2011 Summer Research Projects



## Appendix 1

### Summary of 2010 summer research reports

**Awardee:** Alison Allukian V'12  
**Mentor:** Dr. R. Alders  
**Research Project:** Cold Chain Monitoring in Support of Efficacious Newcastle Disease Vaccination Campaigns in Village Chickens In Tanzania.

**Summary:** This study was conducted to ascertain the efficiency of the thermotolerant I-2 Newcastle disease (ND) vaccine cold chain from Central Veterinary Laboratory (CVL) in Dar Es Salaam, Tanzania to the rural village of Mughanga in Singidia, Tanzania. Vaccine storage and transportation equipment was evaluated using minimum/maximum thermometers and data loggers and vaccine vials titres were checked for potency at the beginning and end of the trial. The temperatures recorded by the data loggers demonstrated that most storage and transportation equipment were outside of the recommended 2-8 °C for thermolabile vaccines and at times outside of the 0 and 28 °C outer limits for thermotolerant I-2 ND vaccine. The storage refrigerators in the three locations of CVL, Singidia District Council, Mtinko ward and the Ilongero Health Center did not demonstrate large fluctuations in temperature, but were maintained at less than ideal temperatures. All vaccines retained potent levels at or above  $10^6$  ED<sub>50</sub> per dose. The vaccine sample from the Mtinko ward was the only one that returned an unusual finding with the recorded titre increasing to  $10^{8.1}$  from  $10^{6.9}$  EID<sub>50</sub>. This study revealed adequacy in maintaining the recommended parameters for the cold chain from Dar Es Salaam to Singida for the storage refrigerators as well as in transportation of the thermotolerant I-2 ND vaccine.

**Awardee:** Bronwen Childs V'12  
**Mentor:** Dr. C. Kirker-Head  
**Research Project:** *In vivo* Method for Tracking 3D Kinematics of the Equine Metacarpophalangeal Joint: A Preliminary Study

**Summary:** Distal limb injuries occur in all breeds and across all disciplines often resulting in lameness and potentially loss of life. Injuries predominate around the metacarpophalangeal (MCP) joint and the goal of this study was to gain a comprehensive understanding of the 3D motions of the equine MCP joint during walking and trotting. XROMM (X-ray Reconstruction of Moving Morphology) was used to characterize the joint motions of one pony with bone embedded markers while simultaneously collecting force plate data to measure ground reactive forces. XROMM involves linking a bi-planar fluoroscopic x-ray video with morphologically accurate 3D bone model from a CT scan to obtain an accurate 3D reconstruction of the joint in motion. Using the XROMM model, it is possible to measure rotational and translational motion in 3D space with a high degree of accuracy ( $\pm 0.08$  mm). Improved knowledge of the precise motion of the MCP joint will provide a basis for further investigations into the pathophysiology of injuries and the efficacy of therapeutic support leg-wear.

**Awardee:** Andreas Eleftheriou V'13  
**Mentor:** Dr. J. Ellis  
**Research Project:** Effects of Gender and Nest Density on Prevalence of Antibiotic Susceptible Gram-negative Bacteria in Herring Gulls (*Larus argentatus*)

**Summary:** Over the past few decades, antibiotic resistant bacteria have become increasingly common in clinical settings and are now a major global public health concern. Wildlife may aid in the dissemination of antibiotic resistant (AR) bacteria and AR genes. Herring Gulls may be particularly important reservoirs of AR bacteria because they forage and roost at human-modified settings where they may obtain AR bacteria. Although AR bacteria have been found in gulls, there is very little understanding of the ecological and demographic factors influencing carriage and transmission of AR by gulls. In this study, we tested for potential effects of gender and nesting density on the prevalence of Gram negative bacteria exhibiting intermediate

susceptibility to tetracycline and ceftazidime. We collected fecal samples from male and female Herring Gulls at Appledore Island in late May/early June and again in July. Samples were spread onto plates with MacConkey agar either without antibiotics, with 8 mg/mL tetracycline, or with 16 mg/mL ceftazidime in order to quantify the proportion of Gram negative bacteria that exhibited intermediate susceptibility to the two antibiotics. We found no significant effects of nest density or gender on the proportion of Gram negative AR bacteria. Our results suggest that males and females nesting at low and high densities play an equal role in dissemination of AR. However, the lack of observed differences may result from a variety of factors including small sample size relative to the high variability among samples.

**Awardee:** Mariah Foose V'13  
**Mentor:** Dr. R. Alders, Dr. P. Skelly and Dr. E. Gilot  
**Research Project:** *Toxoplasma gondii* and the Health of Free Roaming Cats (*Felis catus*) in Rural France: An Analysis of Hematological Parameters of Seropositive and Seronegative Individuals

**Summary:** Research on the subject of *Toxoplasma gondii* in cats has largely been conducted from a public health perspective. Consequently, the association between seropositivity for *T. gondii* infection and the general health of cats has received less attention and has not been quantitatively measured. Here we measure the impact of *T. gondii* infection, as determined serologically, on feline health. This study tested the hypothesis that seropositive cats would have modified hematological parameters, consistent with poor health, when compared with seronegative cats. A total of 181 samples from domestic and free-roaming cats living in two villages in rural northeastern France, Boulton-aux-bois and Briquenay, Ardennes, were collected. Blood samples were obtained to measure hematological parameters, including hemoglobin, red blood cells, hematocrit, leucocytes (neutrophils, eosinophils, lymphocytes, and monocytes), and platelets. A modified agglutination test (MAT) for anti-*T. gondii* IgG antibodies was conducted to determine seropositivity (antibody titer  $\geq 25$ ). Linear and mixed models were constructed using R 2.11.1 software to analyze the variability of each parameter. In support of the hypothesis, it was found that *T. gondii* seropositive cats had significantly lower levels of hemoglobin, red blood cell counts, and hematocrit ( $P < 0.05$ ) than seronegative cats. No association was found for leucocyte or platelet numbers. This study highlights the hitherto unrecognized effects of toxoplasmosis on domestic cats.

**Awardee:** Laura Harvey V'12  
**Mentor:** Dr. Mark Pokras  
**Research Project:** Clinical Pathology of the Chinese Pangolin: A Conservation Approach

**Summary:** Chinese pangolins (*Manis pentadactyla pentadactyla*) in southern Taiwan. Hematologic parameters include: hematocrit, total and differential white blood cell counts, hemoglobin content, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, red blood cell distribution width, reticulocyte count, platelet number, and mean platelet volume. Serum chemistry values include: total bilirubin, aspartate aminotransferase, alanine aminotransferase, blood urea nitrogen, creatinine, total protein, albumin, calcium, phosphorus, glucose, creatine kinase, uric acid, sodium, potassium, chloride, amylase, lipase, total cholesterol and direct bilirubin. Statistically and clinically significant differences were found between sub-adult (<3.5 kg) and adult (>3 kg) CBC values, which supports the use of separate CBC reference ranges for these groups.

**Awardee:** Thanhthao Huynh V'12  
**Mentor:** Dr. J. Epstein  
**Research Project:** Importing Bush Meat and Disease Through Illegal Wildlife Trade

**Summary:** Abstract: With an increasing trend in the expansion of wildlife trade and a high prevalence of wildlife-derived zoonoses, there is increased potential for the introduction of infectious diseases into importing countries and increased potential public health risks. In particular, the trade of illegal wildlife and wildlife products provides a means for pathogen transmission across borders. In this study, we have detected the presence of herpesvirus in bush meat of various primate species that was confiscated in the United States.

This finding confirms that wild animals carrying pathogens can be introduced to countries via the illegal wildlife trade. Furthermore, these results show that smoking or cooking of bush meat can be incomplete, and does not completely destroy the genomic integrity of some viruses, which leaves questions about the potential risk of infection to either animals or people exposed to imported bush meat.

**Awardee:** Jonathan Kuo V'13  
**Mentor:** Dr. S. Telford  
**Research Project:** A Survey of Avian *Plasmodium* and Haemoproteus in Taiwan Using Blood Smears and PCR

**Summary:** There have only been two extensive studies looking at the diversity of avian *Plasmodium* and *Haemoproteus* in the past 50 years. This is a concern due to the potential for introduction of novel haemoparasites into the Taiwanese ecosystem. In addition, the current standard of diagnosis, the blood smear, requires years of experience, is time consuming, and is less sensitive to small parasite loads. In this study, we sampled 82 birds from 21 unique species. 14 confirmed diagnoses of *Plasmodium* or *Haemoproteus* were made using blood smear. 46 birds screened positive using PCR, of which 21 were sequenced. We found at least four different species of *Haemoproteus* and at least one of *Plasmodium*. Based on sequencing data, *H. Columbae* appears to be the most commonly encountered parasite, accounting for 11 of 21 sequenced samples. The PCR screen was a quick and effective means of screening for avian haemoparasite positives and negatives. However, microscopic analysis is still the best means of obtaining species diagnoses.

**Awardee:** Heather McFarland V'13  
**Mentor:** Dr. M. Pokras  
**Research Project:** Is There A Link Between Climate Change Hemoparasites, and Respiratory Fungal Infections in Common Loons (*Gavia Immer*)?

**Summary:** It has been proposed that climate change will result in an increase in vector borne hemoparasite and fungal respiratory infections. Because we have a 20-year record of these diseases in common loons (*Gavia immer*) in New England, this species may serve as a good model to detect climate associated changes in disease prevalence. This study investigated whether if the climate has changed at lakes where loons breed and whether there has been an increase in hemoparasites and fungal respiratory disease over the last 20 years. *Aspergillus* spp. is an opportunistic fungus that has been implicated in the deaths of many common loons. During 1989 through 2009 on Squam Lake and Lake Winnepesaukee ten loons were found infected with fungal respiratory disease caused by *Aspergillus* spp. A study conducted in the mid 1990s found no hemoparasites in common loons in the study area. In the current study, birds from six lakes were sampled and hemoparasites were found in common loons on all six lakes. No *Leucocytozoon* spp. were seen on light microscopy, but *Haemoproteus* spp. and/or *Plasmodium* spp. were seen. PCR identification of these parasites is pending.

**Awardee:** Deborah Thomson V'12  
**Mentor:** Dr. R. Alders  
**Research Project:** Identification of Priority Diseases in Village Chicken Flocks Vaccinated Against Newcastle Disease in Tanzania.

**Summary:** Newcastle disease is one of the most important poultry diseases in the world. Vaccination programs have been held throughout Tanzania for a number of years. Once vaccination for Newcastle disease had become a regular occurrence in five villages of the Shinyanga district, a research team assessed the prevalence of secondary diseases in village chicken flocks. The most prevalent clinical sign was facial lesions that targeted chicks in the flock, which were consistent with Fowl Pox. Various other illnesses due to nutritional deficiencies, bacteria, or parasites were also observed in the post-vaccinated flocks.

## Appendix 2

### Abstracts of 2011 summer research proposals

**Awardee:** Monika Burns V'13  
**Mentor:** Dr. C. Sharp  
**Research Project:** Evaluation of Serum NT-pCNP as a Diagnostic, Monitoring and Prognostic Biomarker for Dogs Hospitalized in an ICU Setting

**Abstract:** The purpose of this study is to evaluate the use of the amino terminal prohormone of C-type natriuretic peptide (NT-pCNP) as a biomarker for diagnosis, monitoring and determining the prognosis of dogs with sepsis in an intensive care unit (ICU) setting. Additionally, this study will compare a newly developed point of care (POC) assay for NT-pCNP with a validated, canine specific, commercially available enzyme linked immunosorbent assay (ELISA). Sepsis is a condition that is associated with high morbidity and mortality in dogs, and can result in multiple organ dysfunction syndrome (MODS). Sepsis can be challenging to diagnose due to the overlapping clinical signs with non-infectious causes of the systemic inflammatory response syndrome (SIRS). In human medicine, delayed administration of appropriate antibiotics results in increased mortality; the same is likely to be true in dogs, and as such early diagnosis and prompt initiation of antibiotics is vital to ensure a good outcome. Therefore, it is essential that we have reliable diagnostic biomarkers for sepsis in dogs. This study aims to not only confirm the diagnostic utility of a biomarker (NT-pCNP) in a larger population of hospitalized dogs, but also to evaluate its utility to assess response to treatment and prognosticate. This study will be a prospective, serial admission study. It will include all dogs hospitalized in the Intensive Care Unit at the Foster Hospital for Small Animals at the Cummings School of Veterinary Medicine at Tufts University over a two-month period.

There are few limitations currently foreseeable with this study. Since the point of care assay that will be used has already been developed, this study will be validating the assay. Thus, the pitfalls of assay development will be avoided. One potential limitation is that this study will rely on client consent for enrollment, but in the experience of the senior investigator, this has been relatively easy to obtain in >80% of patients in which consent is requested. Given that this is a serial admission study, there should not be a problem obtaining high numbers of subjects, but the number of patients with sepsis will be variable.

**Awardee:** Yamini Chalam V'14  
**Mentor:** Dr. G. Kaufman  
**Research Project:** Nutritional Analysis and Comparison of Diets Offered to Captive Elephants in Nepal

**Abstract:** The main objective of this study is to analyze the diets offered to the captive elephants in Nepal in order to determine the nutritional value of the diet. This will involve gathering background data on the elephant and the diet, chemical analysis of their feed and supplements, and body condition scoring. The study will be conducted in the buffer zone of the Chitwan National Park, within the vicinity of Sauraha, located in the Chitwan District of Nepal. Approximately 160 of the 200 captive elephants of Nepal reside in this general area, under government care or private ownership. Data will be collected from elephants from a variety of settings including the government national park, the conservation breeding center, luxury and budget hotels, as well as those elephants under independent ownership. The data collection and analysis will be broken down into three steps. First, the owner or handler (Mahout) will answer a questionnaire for an individual elephant in order to gather background data on the elephant and their current diet. Second, feed samples will be obtained from each elephant and chemically analyzed to quantify the presence of eight important nutritional components. The presence of these components among the different diets will be compared to identify any dietary trends. Third, the body condition of each elephant will be analyzed and scored to determine whether there is a correlation between dietary nutrition and body condition. The analysis will be used to identify nutritional deficits and help formulate dietary guidelines for captive elephants. Elephants have a long history in Nepal and play a role in their cultural and religious traditions. The drastic decline in wild elephants over the last 50 years prompted the Nepalese government to institute captive elephant breeding programs for their protection and survival. These efforts are dependent on the health of the elephant, as disease and reproductive failure threaten captive

elephant populations. Establishing good nutrition for these elephants is crucial to improving their breeding potential and decreasing their susceptibility to disease.

**Awardee:** Anne Flemming V'13  
**Mentor:** Dr. S. Marshall and Dr. J. Lindenmayer  
**Research Project:** Quantifying the Spatial Distribution and Population Size of Feral Cat Colonies in Rhode Island as a Function Population Management Strategies

**Abstract:** The increase in the size and number of feral cat colonies in the United States is a growing concern for public health officials, animal welfare organizations, wildlife advocates and the general public. Feral cats can carry zoonotic and infectious diseases that affect human, companion animal and wildlife health. In addition, wildlife advocates and management professionals are concerned about feral cats' hunting behaviors having a negative impact on native bird, small mammal and reptile populations. To date, studies on feral cat population management strategies such as trap-neuter-release and trap-euthanize have been limited to a single, or small number of colonies, and have reported conflicting results. The proposed study will provide baseline data on the locations of a representative sample of feral cat colonies in Rhode Island, an estimate of their current populations, and the management approach, if any, used for each colony. Locations of feral cat colonies and associated management strategies will be identified by conducting interviews with individuals with knowledge of the specific feral cat colonies in Rhode Island. Using a Geographic Information System (GIS), a statewide map of the location and spatial distribution of representative feral cat colonies will be developed. A Lincoln-Peterson Index will be used to estimate population size at each colony, where animals visually identified on day 1 are treated as "marked," since no physical capture of animals is planned. Thus, animals seen on day 2 that were not detected on day 1 would be assumed to be "unmarked." The L-P index uses the ratio of marked to unmarked animals to estimate population size. The GIS maps will be amended to include estimates of feral cat colony population size based on L-P indices. In addition, estimates of cat density (cats/mile<sup>2</sup>) per colony's home range will be provided for select colonies around the state (exact methodology will be discussed and further refined with the RI Feral Cat Working group). Descriptive statistics of the colony data by management approach will be calculated using SPSS release 18.0.0. This information will be used in a subsequent study in 2012 to evaluate the efficacy of the various management approaches applied, and ultimately develop a comprehensive evidence-based recommendation for feral cat colony management in Rhode Island. Given the absence of any similar comprehensive, statewide evidence-based analysis of this issue, other communities dealing with feral cat management issues may benefit from the findings of this research.

**Awardee:** Max Gordon V'14  
**Mentor:** Dr. S. Mor  
**Research Project:** Evaluating Cost-Effective Rabies Treatments in Uganda

**Abstract:** Study Objectives: Rabies is a zoonotic disease endemic to Uganda that is considered to be entirely preventable when appropriate measures are taken. Utilizing a two-step process this study aims to determine the most cost effective preventative rabies treatment for Uganda. This study also intends to identify the factors that account for the Moyo district's high incidence of rabies. **Hypothesis:** The cost of vaccinating the main rabies reservoir, the domestic dog, is the most cost effective preventative rabies treatment for Uganda. **Experimental Design and Significance:** This experiment will investigate the cost of treating rabies by either post exposure prophylaxis vaccine in the human population or vaccinating the domestic dog population in Uganda. The results of this study will provide a recommendation for combating rabies in rabies endemic Uganda.

**Awardee:** Jessie Hamilton V'14  
**Mentor:** Dr. R. Alders  
**Research Project:** Identification of Constraints Impacting Poultry Production in Muchila, Zambia

**Abstract:** This project aims to identify and document the major constraints to rural poultry production in the village of Muchila, Zambia. A combination of household interviews and focus group discussions will be used to

collect data representing the community members' perceptions about various topics relating to poultry production. Poultry production is pivotal in the lives of Zambians culturally, economically and for their health. Unfortunately, there are many constraints that impede poultry production. This can be devastating for families, especially for those who depend on poultry to generate a significant portion of their income. Research to identify the main constraints impacting production in the village of Muchila, in the Namwala district, has not yet been conducted. This project will serve to provide important baseline data that will allow for the development and implementation of improvement programs in Muchila in support of increased production.

**Awardee:** Katherine Holmes V'13  
**Mentor:** Dr. J. Mukherjee and Dr. K. Lindell  
**Research Project:** Surveillance of *Brucella* spp. in the goat population of the Dominican Republic

**Abstract:** **Aim 1:** Determine prevalence of Brucellosis in goats within selected regions of the Dominican Republic. **Aim 2:** Identify husbandry practices and meat and milk handling processes that could be improved to prevent transmission of Brucellosis. **Aim 3:** Provide simple recommendations to prevent Brucellosis transmission. **Animals:** Privately-owned, rural, small-herd goats from provinces of the Dominican Republic with the highest, median, and lowest documented incidence of Brucellosis within the human population. **Procedures:** Serological testing will be performed using the Rose Bengal Serum Agglutination Test. A questionnaire of the goat tenders for assessment of customary goat management practices will be conducted verbally. Information for prevention measures against zoonotic disease transmission will be provided verbally and in a brochure. **Relevance:** Brucellosis is a zoonotic disease that affects mammals globally. More than 500,000 humans are affected annually. Between January of 2008 and of June 2010, 650 humans in the Dominican Republic were diagnosed with Brucellosis. As the livestock population is a very possible reservoir, serological testing to assess the prevalence of *Brucella* spp. in the goat population would provide evidence that *Brucella* is present in the goat population in the Dominican Republic. At present, there is no evidence of this investigation in the Dominican Republic. Surveying the goat farmers is of importance. The identification of practices with potential risk for human infection is crucial. These same practices may also perpetuate the disease within the goat population. Obtaining information such as observed clinical signs associated with Brucellosis, dairy product and birthing material handling procedures, and vaccination history would be useful in inference production of disease transmission. Culturally and linguistically-sensitive information on safe animal and animal product handling procedures would aim to prevent future zoonotic disease transmission.

**Awardee:** Kristy Jacobus V'14  
**Mentor:** Dr. S. Ayres and Dr. J. Connolly  
**Research Project:** Characterization of the Reproductive Cycle of the Platypus (*Ornithorhynchus anatinus*) Through Non-Invasive Identification of Fecal Hormone Metabolites

**Abstract:** The purpose of my study is to examine reproductive hormone metabolites collected from free-ranging platypuses (*Ornithorhynchus anatinus*) in order to make inferences about the platypus reproductive cycle and to determine the validity of the use of fecal hormones as a noninvasive mode of determining reproductive activity in the platypus. This research will be performed under Dr. Joanne Connolly at Charles Sturt University in Wagga Wagga, NSW, Australia. Platypuses were caught from the Murrumbidgee catchment using a catch and release method. The platypuses were assessed for a variety of physiological parameters, and blood and excreta were obtained and saved. Hormone levels from collected serum have been determined using enzyme immunoassay. I will use high performance liquid chromatography (HPLC) to assess the estrogen and progesterone metabolites from the feces of these platypuses. This hormone metabolite data will be compared to the previously determined levels of hormones from the blood to determine if there are correlations of hormonal metabolites in the feces to hormone levels in the blood. If correlates are found, it could allow for a non-invasive way of assessing the reproductive cycle in both wild and captive platypuses. This research is part of an overlying, comprehensive study of platypuses from the Murrumbidgee catchment that is being performed in order to gain an understanding of this specific population of platypuses. The platypus is currently not considered an endangered or threatened species, however, declines in numbers and changes in distribution have occurred since the settlement of Australia by Europeans. Furthermore, captive

reproduction of this species has yielded little success further highlighting the need for an increase of our knowledge of their reproduction. By gaining an understanding of their reproductive cycle and through identification of a noninvasive assay for reproductive activity, we may be able to assist in their reproduction both through natural and artificial means in the wild and in captivity to ensure their continued survival.

**Awardee:** Joe Khodari V'13 – University of Pennsylvania  
**Mentor:** Dr. Dominique Penninck  
**Research Project:** Ultrasonography of Colonic and Cecal Neoplasia in Cats

**Abstract:** A few reports in the veterinary literature have addressed the ultrasonographic appearance of tumors in small animals. Currently, no studies evaluating the place of ultrasonography in evaluating colonic and cecal tumors in cats, are available. 17 This retrospective research project reviewing cases collected since 2004 aims to describe the demographics, clinical presentation and ultrasonographic features of the most commonly encountered colonic and cecal tumors affecting cats. All of these features will be organized on a excel table. The ultrasonographic and histopathological findings will then be compared in order to extract possible features such as extension/size of the lesion, regional lymphadenopathy, and metastasis that can assist in better ranking these lesions prior to final diagnosis. Whenever available, the treatment choice and outcome will also be evaluated. These features could also assist the clinician in choosing the next suitable procedure (ultrasound-guided core biopsies versus surgical biopsies). This retrospective descriptive study will complement the current literature by addressing and comparing both the imaging and histopathological aspects of these tumors.

**Awardee:** Sarah Lim V'14  
**Mentor:** Dr. L. Wetmore  
**Research Project:** Optimizing the Use of Pulse Oximetry and Assessing its Usefulness in Detecting Decreased Pulmonary Function in Elephants with Tuberculosis

**Abstract:** Captive elephants have historically been an integral part of Nepalese culture and society. Tuberculosis caused by *Mycobacterium tuberculosis* or *Mycobacterium bovis* has re-emerged as an important infectious disease in many domestic and wild animals, especially captive elephants. A seropositive rate approaching 25% has been determined with ongoing systematic testing of nearly all the captive elephants in Nepal. In these infected elephants, the major pathology occurs in the lungs and thoracic lymph nodes. Though pulmonary function is affected by the sequelae of the disease, clinical signs are not always apparent. Significant efforts have been made to find increasingly sensitive tests to detect *Mycobacterium* infection in elephants, as well as to develop effective management strategies to limit spread of the disease between humans, cattle, and elephants. Early diagnosis would help reduce this risk of transmission and allow for earlier implementation of treatment. The use of pulse oximetry as a non-invasive mode of assessing oxygenation is becoming more prevalent in anesthetized animals and in humans with compromised pulmonary function associated with pneumonia and tuberculosis. Currently, there is no recommended method of assessing lung function in elephants. The purpose of the initial phase of the study will be to find the optimal combination of a pulse oximeter and a sensor placement site on elephants that produces the most reliable oxygen saturation readings. This combination will be adopted in the second part of the study that will test the usefulness of the technology in detecting decreased pulmonary function in elephants with tuberculosis. It will also be used to monitor oxygenation in TB-positive elephants showing clinical signs or undergoing treatment over the course of six to eight weeks. Pulse oximetry offers a noninvasive method to detect hypoxia as a result of a decrease in pulmonary function due to the sequelae of tuberculosis. This technology would be useful in identifying animals with a high probability of pulmonary disease and could ultimately be used as an adjunct to more specific and sensitive serological diagnostic techniques for tuberculosis.

**Awardee:** Cecilia Murch V'13  
**Mentor:** Dr. Joann Lindenmayer  
**Research Project:** Rabies Prevention in Kathmandu, Nepal: Evaluating the Efficacy of Canine Sterilization and Vaccination

**Abstract:** Rabies is a zoonotic viral disease that poses a substantial public health threat to developing nations. Although rabies is preventable, tens of thousands of individuals die from the disease each year. In countries where rabies is endemic, there is the added challenge of having limited resources with which to combat the disease. Barriers to effective disease control include poor reporting systems, low levels of public awareness, and sparse availability of post exposure care. Many cases of rabies go undiagnosed, misdiagnosed, or unreported. As a result, nations are rarely able to determine the true burden of the disease, thus perpetuating the cycle of under-recognition and inadequate action. Evaluating the actual cost of the disease and the efficacy of current control methods is essential in order to bolster governmental and institutional support for prevention programs. Because dog bites are the leading cause of rabies transmission, recent prevention strategies have focused on the control and vaccination of dog populations. In order to demonstrate the efficacy of such programs, an association must first be drawn between the implementation of dog sterilization and vaccination programs and a decline in the transmission of rabies. In Nepal, rabies is thought to claim over 200 lives each year. Over the past six years, prevention efforts have consisted of mass vaccination and sterilization of community dogs, which has resulted in a steep decline in their population. The goal of the proposed study is to evaluate the effectiveness of current prevention efforts as they relate to the dog population and the occurrence of dog bites and reported rabies cases. Characterizing the relationship between the dog population and rabies transmission will be key in establishing support for the continuation of current prevention programs.

**Awardee:** Casey Penrod V'14

**Mentor:** Dr. BB Verma

**Research Project:** Studies on the Effect of Teat Dipping Post-Milking of Lactating Crossbreed Cows in Control of Subclinical Mastitis

**Abstract:** Bovine mastitis is the most costly disease of dairy cattle due to economic losses from reduced milk yield, treatment cost, increased cost of labor, milk withholding after treatment, death, and premature culling due to loss of productivity of the mammary gland. Subclinical mastitis is often overlooked by farmers as no visible signs of disease are evident and changes in the milk and in the gland can go undetected to the level of the loss of both production and the gland. Mastitis is caused by a variety of pathogens, most notably bacteria such as *Staphylococcus aureus*, *Streptococcus agalactia*, *Streptococcus dysgalactia*, *Streptococcus uberis*, and *Escherichia coli*. At most commercial farms regular indirect testing of individual milk samples of pooled milk samples is done to detect subclinical mastitis, however some farmers are not aware of certain hygienic measures like post-milking teat disinfection, to control the spread of pathogens. India stands number one globally in milk production by the number of animals in production, and while control measures have been taken to prevent occurrence of infectious disease, mastitis remains a challenge. Studies have indicated that approximately 10-50% of India's cows suffer from subclinical mastitis. Realizing the importance of the disease in dairy economics for the farmers, it is absolutely necessary to monitor and detect subclinical mastitis, take necessary measures for control, and reduce the level of disease within the herd. The incidence of subclinical mastitis will be determined among a dairy herd at an organized farm near Kolkatta, through the indirect California Mastitis Test. Once I have determined a baseline prevalence of infection of quarters throughout the herd, I will introduce the farmer to the method of postmilking teat-disinfection. The farmer will be advised to dip teats in antiseptic after both the morning and evening milking. I will return to the farm weekly to conduct further indirect tests on the herd throughout the duration of my stay to determine the effect of the teat-disinfection method on the incidence of subclinical mastitis within the herd, as determined by somatic cell count.

**Awardee:** Natasha Pogue V'14

**Mentor:** Dr. BB Verma

**Research Project:** Seroprevalence of Caprine Brucella melitensis in West Bengal, India

**Abstract:** *Brucella melitensis* infection (Brucellosis) is an important re-emerging disease that has become a neglected endemic in India. Its zoonotic potential and harm to the Indian economy makes it a significant veterinary and public health concern. With an estimated 124.4 million goats and 1.1 billion people in India, the prevalence of this disease should be known, but unfortunately, it has not been determined. My study will be



located in West Bengal, India where I will be examining seroprevalence of *B. melitensis* in goats. I will be collecting blood samples from 300 goats. My study sample will be from 150 randomly selected privately owned goats in villages near the West Bengal University of Animals and Fishery Science, and my control sample will consist of 150 randomly selected government owned goats that are managed with preventive measures against infection. The composition of both the control and study population will be similar based on vaccination status, age, sex and breed to control for these confounding variables. Goats considered eligible for both populations will include all unvaccinated goats over 6 months of age and *B. melitensis* vaccinated Rev-1 vaccinated goats older than 18 months. A pre-tested interview questionnaire will be administered to goat owners and/or managers at the time of sample collection to gather demographic information as well as a complete animal history from both sample populations. It will also assess the owner/manager's knowledge of animal husbandry as well as animal and human risk factors for brucellosis. Serum samples collected will be insulated in a portable cooler and then tested at the veterinary school's laboratory by the Rose Bengal plate agglutination test, and if positive, will be verified with standard tube agglutination tests. If the doe is lactating, milk samples from each teat will be collected and tested by iELISA at the school laboratory. The proper officials will be notified of any positive cases. In order to protect the goat industry and humans against *Brucella* infection there needs to be continuous and accurate surveillance of *B. melitensis*. Since *B. melitensis* seroprevalence studies have been limited in India my study will help to expand baseline surveillance and determine the prevalence of *Brucella* in goats raised by private farmers as well as those under control of the government. It will identify risk factors and demonstrate the need to institute preventive animal husbandry among the private goat farms.

**Awardee:** Emily Roye V'13  
**Mentor:** Dr. E. McCobb and Dr. J. Lindenmayer  
**Research Project:** Assessment of Handwashing Protocols and Attitudes at Boston Area Animal Shelters

**Abstract:** It is known that hands serve as mechanical vectors for bacterial, viral and parasitic diseases. This is the rationale behind hand-washing protocols in the hospital and clinic settings. Animal shelters vary greatly in design and capacity, but they can house large numbers of animals in relatively small spaces. Shelter animals are often subject to high levels of stress and are prone to high levels of infectious disease. Some of the diseases and parasites carried by these animals can be transmitted to humans and many are transmissible via human hands to other animals in shelters. Despite this, little is known about the frequency with which shelter personnel wash or sanitize hands. This exploratory study aims to examine the frequency with which volunteers and staff members wash their hands between handling animals. Five shelters representing different facility design and operational types will be selected and each shelter chosen will be visited at specified times for one week. During that time, volunteers and staff will be told that they are being observed for a study, but the precise nature of the study would not be revealed. At the end of each observation period, willing volunteers will be asked a series of questions which will include questions about their knowledge of the shelter's hand washing protocols, and assess their knowledge and attitudes about the importance of hand washing. Furthermore, a sample of 25 shelters will be chosen at random to receive a questionnaire about hand-washing protocols, training in hand washing, and use of exam gloves. This information will provide much needed information about hand-washing in the shelter environment, and can help inform further studies, including more targeted studies about hand-washing compliance in shelter settings.

**Awardee:** Stanley Sowry V'14 – Western University  
**Mentor:** Dr. Abhineet Sheoran  
**Research Project:** Neutralization of Stx2 by scFvs

**Abstract:** Infection with Shiga toxin (Stx1)- and Stx2-producing *Escherichia coli* (STEC) is the most significant cause of hemolytic uremic syndrome (HUS), the leading cause of acute renal failure in children. While Stx1 and Stx2 are similar in basic structure, binding specificity and mode of action, Stx2-producing strains are more frequently associated with HUS than strains that produce both Stx1 and Stx2 or Stx1 alone. There is no specific treatment to prevent or ameliorate STEC associated HUS. Two Stx2-specific human monoclonal antibodies (HuMAbs), 5C12 and 5H8, have shown excellent protective efficacy in preclinical evaluation studies

in animal models against systemic Stx2 or oral STEC challenge. However, the low production yield of these antibodies by hybridoma or Chinese hamster ovarian (CHO) cells, and likely cost, are major factors limiting commercial production in the large quantities needed for stock piling in the event of bioterrorist threat, or in the face of a major outbreak due to food contamination. Hence, we propose here to express Fv regions of 5C12 and 5H8 in *E. coli* as single-chain Fv fragments (scFv) in which the small Stx2-binding V<sub>H</sub> and V<sub>L</sub> domains are joined together separated by a flexible spacer region. ScFvs are cheaper to produce, and expression is much higher than antibodies produced by hybridomas or CHO cells. For *E. coli* expression, the gene containing the V<sub>L</sub> domain-flexible spacer region-V<sub>H</sub> domain of 5C12 or 5H8 will be synthesized, cloned in pET-32b vector, and expressed for affinity purification as His-tag scFvs. The selection of pET-32b vector is based on its ability to express proteins with improved solubility and sulfide bridge formation. The ability of scFvs to interact with and neutralize Stx2 will be analyzed by ELISA and HeLa cell cytotoxicity assay, respectively. If scFvs of 5C12 and 5H8 can neutralize Stx2, they will be far more cost effective for clinical use than antibody therapy.

**Awardee:** Casey Tucker V'13  
**Mentor:** Dr. J. Mukherjee  
**Research Project:** Ducks as biological parasite control : a survey of snails, rats, ducks, and gibbons, and the prevalence of *Angiostrongylus Cantonensis* at the Pingtung Rescue Center, Taiwan

**Abstract:** This is a multi-faceted project to discover baseline data that will support potential future research. The goal is to eventually test whether ducks can be used to decrease the incidence of *Angiostrongylus cantonensis* infections in gibbons in captivity. In order to facilitate this, it is first necessary to determine the types and locations of snails present in the Pingtung Rescue Center, and if the snails are infected with *A. cantonensis*. Once it is known if the snails contain the parasite, and that they are located within the gibbon's enclosures, then it will be possible to evaluate if the presence of ducks influences the number of snails. The goals of this project are:

- to map the number and distribution of gibbons, ducks and snails in the rescue center
- to determine the number and distribution of snails and other gastropods as well as the species
- to determine if the snails are positive for *A. cantonensis*
- to evaluate medical records to assess the morbidity and mortality of gibbons and ducks due to *A. cantonensis*
- to determine the population and species of rodents (especially rats) in the rescue center and determine the prevalence of *A. cantonensis* infection, with an aim to improve rodent control

I will collect samples of slugs and snails from the rescue center and examine their lungs for evidence of *A. cantonensis* infection. In addition, I will examine rat feces for evidence of stage one larvae. Also, I will count and compare the number of snails found daily in enclosures with ducks versus those without ducks, and compare how ducks influence the snail numbers. Finally, I will observe medical records and perform dot-blot ELISAs on the gibbons to detect non-lethal infections. This project will establish baseline data on the types of local snails and their distribution, the relative numbers of snails in enclosures with ducks versus those without ducks, and the presence of *A. cantonensis* in snails, slugs and rats at the center. It will identify areas that can be controlled to minimize the spread of *A. cantonensis*, a serious zoonotic parasite. The data collected in this study will enable future research into the effects of ducks on parasite infection in gibbons.

**Awardee:** Laura Turner V'14  
**Mentor:** Dr. Elizabeth Rozanski and Dr. Emily McCobb  
**Research Project:** Relationship between serum 25-hydroxyvitamin D level and diagnosis of upper respiratory infection in cats in the shelter environment

**Abstract:** Upper respiratory tract infection (URI) among cats is notoriously difficult to control in the shelter environment and, consequently, a leading reason for euthanasia and reduced adoption rates. The use of nutritional supplements to boost immune function and thus help prevent or manage the symptoms of URI could be a cost-effective way for shelters to reduce the spread of URI. Vitamin D has recently gained attention in

human medicine as a modulator of immune function and inflammation. Specifically, strong correlations have been found between low vitamin D levels and several respiratory diseases in humans including tuberculosis, upper respiratory tract infections ('common colds'), cystic fibrosis, and asthma. Such promising human data lead to the hypothesis that low vitamin D levels will predict future upper respiratory tract diagnosis in cats. For the proposed study, serum blood samples will be collected from cats upon intake at the shelter. Subsequently, the cats will be monitored for symptoms of URI for several weeks after their introduction to the shelter environment. Banked serum samples from cats which developed URI will be compared with age-matched cats that did not develop URI. If lower serum levels of 25-hydroxyvitamin D are found in the cats with URI, dietary supplementation could be further evaluated in shelters as a prophylactic measure to reduce the incidence of upper respiratory infections among cats in the shelter, thus increasing rates of adoption.

**Awardee:** Annie Whitford V'14 – Louisiana State University Veterinary School  
**Mentor:** Dr. Alison Robbins  
**Research Project:** Terbinafine Dosage and Safety in WNS Infected *Myotis Lucifugus*: Correlation of Survival, Drug Tissue Levels, and Toxic Effects

**Abstract:** As a student working with this project I will be assisting in the tissue sample testing of Terbinafine levels of small brown bats (*Myotis lucifugus*) known to have White Nose Syndrome. Tissue will be taken at 1 month, 2 month and 5 month intervals from the wing, hair, pelt, and liver of bats treated with designated amounts of the antifungal drug Terbinafine. The amount of Terbinafine and the presence of WNS will be determined in each tissue and each tissue is categorized by the bat subgroup that it was taken from. This is a small part of a larger study being done to determine the effectiveness and dosage amounts of Terbinafine treatment for WNS in bats.